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Taking A Page From The On-Balance Volume

Gap Momentum

Here's a way to use opening gap data to create a momentum strategy.

by Perry J. Kaufman

I was reminded recently that J. Welles Wilder, who I knew personally, was fascinated by opening gaps. We have all thought about those pesky moves that can give you a poor fill or jump through your stop-loss. I have tried to take advantage of them by buying a pullback or selling an unusually large gap up. I have had some success trading intraday, but always thought there might be other ways to take advantage of gaps.

Do gaps have a pattern? Can they tell us where prices are going?

Let's take a page from Joseph Granville's on-balance volume (OBV). In a new series, he added the volume when prices closed higher and subtracted the volume when prices closed lower. It simply accumulated the volume. If you used the OBV series instead of price, you find that, in many cases, a trend system worked better. I'll leave that for you to try.

THE MOMENTUM OF GAPS

If we apply the same concept as OBV using gap openings (today's open minus yesterday's close), we get a cumulative series as follows:

1. Start with zero.
2. Add all the positive gaps over the past N days.
3. Separately, add all the negative gaps (as positive numbers) over the last N days.
4. Calculate the *gap ratio*, the positive gaps divided by the negative gaps.
5. Add the gap ratio to the cumulative gap ratio, and call it *gap momentum*.
6. Keep moving forward as you would an N-day moving average.

See the sidebar "Gap Momentum Indicator And System, In EasyLanguage" for code to make these calculations.

In the following examples, I have used only a 1-day ratio, that is, $N = 1$. I consider that the benchmark test. I have also used $N = 20$ with the result even better. You will need to find your own smoothing value. As you
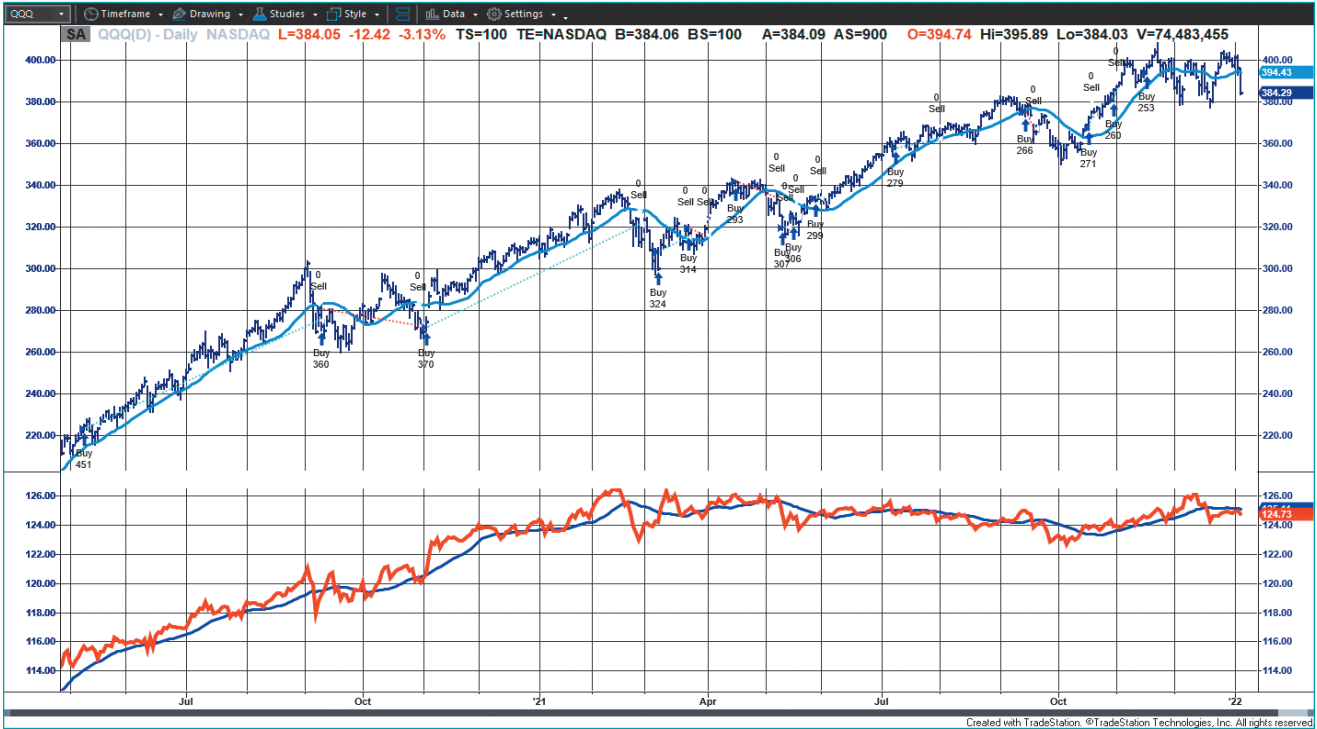
TRADING STRATEGIES

FIGURE 1: GAP MOMENTUM INDICATOR. In the top panel is the QQQ with a 20-day moving average and trading signals based on the gap momentum indicator. In the bottom panel is the gap momentum (red) and the signal line (blue).

smooth more, you will increase the lag.

The new series, *gap momentum*, will be treated in the same way as we used OBV. But first we apply a moving average because the series is a bit noisy, just like prices.

PARAMETERS

Only slow moving averages seem to work for equity index markets. They also work for most stocks. We collected the average gap ratio using a 1-day ratio (you might try 20 days) then applied a 40-day average to the gap ratio to get our signal line. It is the direction of the signal line that determines our trade.

TRADING RULES

That gives us trading rules:

- *Buy* when the signal line is moving higher.
- *Exit* when the signal line is moving lower.

Because we are trading stocks, we will only take long positions. For each new trade, the position size is the initial investment divided by the closing price. We execute on the open following a new trading signal, which was generated without the current day's gap.

Ticker	Net Profit	Profit Factor	Trades	% Prof. Trades	MaxDD	Profit/ Drawdown
SPY	$93,447	3.25	61	49.2%	($23,778)	3.93
QQQ	$189,977	4.51	40	50.0%	($32,868)	5.78
AMZN	$253,389	3.63	63	49.2%	($69,671)	3.64
BA	$147,881	1.96	84	41.7%	($84,376)	1.75
BAC	$164,263	2.79	46	37.0%	($31,254)	5.26
MCD	$88,299	2.82	64	39.1%	($27,944)	3.16
TSLA	$1,468,969	6.97	67	35.8%	($779,566)	1.88
Average	**$343,746**	**3.70**	**61**	**43.1%**	**($149,922)**	**2.29**

FIGURE 2: TEST RESULTS FOR 100-DAY SMA SYSTEM. Shown here are the results of a test of a 100-day simple moving average system. This test uses stocks and ETFs over 10 years of data (2010 through 2021).

Ticker	Net Profit	Profit Factor	Trades	% Prof. Trades	MaxDD	Profit/ Drawdown
SPY	$82,245	2.09	104	54.8%	($22,133)	3.72
QQQ	$122,695	2.37	112	61.6%	($20,166)	6.08
AMZN	$158,068	2.68	71	50.7%	($69,671)	2.27
BA	$150,639	2.04	82	56.1%	($69,097)	2.18
BAC	$188,465	2.09	112	57.1%	($54,867)	3.43
MCD	$101,242	2.97	64	50.0%	($16,862)	6.00
TSLA	$853,803	10.28	65	60.0%	($151,278)	5.64
Average	**$236,737**	**3.50**	**87**	**55.8%**	**($57,725)**	**4.10**

FIGURE 3: TEST RESULTS FOR GAP MOMENTUM. Shown here are the results of a test of a 1-day gap momentum system with a 20-day signal line, on the same instruments and time period as in Figure 2 for comparison. In the test, the simple moving average system shows higher profits and higher risk, while the gap momentum system shows smoother returns but lower net profits.

GAP MOMENTUM INDICATOR AND SYSTEM, IN EASYLANGUAGE

```
// Gap Momentum
// An idea inspired by J. Welles Wilder, using Ehlers method
// Copyright 2023 P.J. Kaufman. All rights reserved.

inputs:  period(40), signalperiod(20), longonly(true),
printfile(true);
vars:     gap(0), upgaps(0), dngaps(0), gapratio(0), ix(0),
signal(0), size(0),
              investment(100000), adate(" "), todayPL(0);

for ix = 1 to period begin
    gap = open[ix] - close[ix + 1];
    if gap > 0 then upgaps = upgaps + gap
        else if gap < 0 then dngaps = dngaps - gap;
    end;
if dngaps = 0 then gapratio = 1
    else gapratio = 100*upgaps/dngaps;
signal = average(gapratio,signalperiod);

if marketposition <= 0 and signal > signal[1] then begin
        buy to cover all shares next bar on open;
        size = investment/close;
        buy size shares next bar on open;
        end
    else if marketposition >= 0 and signal < signal[1] then
```

```
begin
        sell all shares next bar on open;
        if longonly = false then begin
            size = investment/close;
            sell short size shares next bar on open;
            end;
    end;

todayPL = size*marketposition*(close - close[1]);

If printfile then begin
    adate = ELdatetostring(date);
    once begin
        print(file("c:\tradestation\Gap_Momentum.csv"),
        "Date,Open,High,Low,Close,upgaps,dngaps,gapra
tio,signal,pos,todayPL");
        end;
        print(file("c:\tradestation\Gap_Momentum.csv"),adate,
    ",", open:8:4, ",", high:8:4,
    ",", low:8:4, ",", close:8:4, ",", upgaps:8:4, ",", dngaps:8:4, ",",
    gapratio:8:4, ",", signal:8:4, ",", marketposition*currentcontra
cts:8:4, ",", todayPL:8:2);
        end;
```

To see what this looks like, Figure 1 is a Trade-Station chart of QQQ, with the gap momentum (in red) and the signal line (in blue) in the bottom panel. Trading signals are shown in the top panel along with a 20-day moving average just for reference.

	Net Profit	Profit Factor	Trades	% Prof. Trades	MaxDD	Profit/ Drawdown
SMA	$35,385	1.31	51	29.4%	($131,999)	0.27
Gap Mom	$32,224	1.26	106	56.6%	($42,301)	0.76

FIGURE 4: SAME TEST, DIFFERENT TIME PERIOD. Here are results from a test of both the SMA system and the gap momentum system using a different, less bullish time period, 1999–2009, to further analyze how both systems perform under different conditions. Compared to the SMA system, the gap momentum system, in this test, has a higher percentage of profitable trades and a much lower drawdown.

EXAMPLES

I used data for the 10 years ending at the end of 2021. While it includes a long bull market, prices became erratic in 2019 and Covid-19 caused extreme changes and sector rotation in 2020 and 2021. Those 10 years seem to be a reasonable test period. Choosing a few markets to test is always a problem. Are they representative of the way the strategy will work? I can't say. There are always markets that work better and those that do not work. You will need to test them yourself to get

a better idea of the robustness of the method.

These tests used the ETFs: SPY, QQQ, and the stocks: Tesla (TSLA), Amazon (AMZN), Bank of America (BAC), Boeing (BA), and McDonalds (MCD). They seem to cover a range of popular and diverse markets.

Figure 2 shows the results of a simple 100-day moving average and Figure 3 is a comparable table of the 1-day gap momentum results with a 20-day signal line. Both reflect the data from 2010 through 2021. Both use the direction of the trendline to decide the buy and sell timing. Both execute on the following open.

COMPARING RESULTS

The first number we notice is the much lower net profit using the gap momentum system. But a closer look will show that it is not that simple. The profit factors are nearly the same, the percentage of profitable trades increases from 43% to 55%, and the average maximum drawdown

The comparative performance of the simple moving average and the gap momentum is typical of the decisions that need to be made.

is close to 1/3 of the moving average system. When we compare the profits divided by the maximum drawdown, a ratio that shows returns for risk, we get a value that is nearly twice as good, 4.10 versus 2.29, as the simple moving average.

Long-term moving averages work, as we see from the consistent profits. But alternatives offer both diversification and a new performance profile. In this case, you accept lower returns with much lower risk. The profit/drawdown ratio shows it gives a better "payout."

FIGURE 5: COMPARISON OF MOVING AVERAGE SYSTEM VS. GAP MOMENTUM SYSTEM RETURNS. Using the QQQ instrument, this charts the total profits from the simple moving average system versus gap momentum system on a decade of data. The gap momentum system has lower returns than the moving average system, but as was seen in Figure 4, the gap momentum system has a better profit/drawdown ratio.

TESTING THE END OF THE INTERNET BUBBLE

The data interval used for the tests might seem suspiciously favorable, even though it wasn't chosen that way. After all, it looks as though all stocks were profitable during that 10-year period. To see what would have happened at the end of the internet bubble and through the 2008 financial crisis, we tested QQQ from 1999 to 2010. The results are shown in Figure 4.

While the profits are lower, they are only lower by 9%; otherwise, the comparison is similar. The gap momentum method had a much higher percentage of profitable trades and a much lower drawdown. The profit/drawdown ratio was nearly three times better.

WHAT PERFORMANCE PROFILE DO YOU WANT?

Some traders are risk seekers, others are risk averse, and most fall somewhere in between. We want more profits but not much more risk. Figure 5 shows the total profits of QQQ using the simple moving average and the gap momentum system. The simple moving average has higher profits and higher risk. The gap momentum method has much smoother returns but lower net profits.

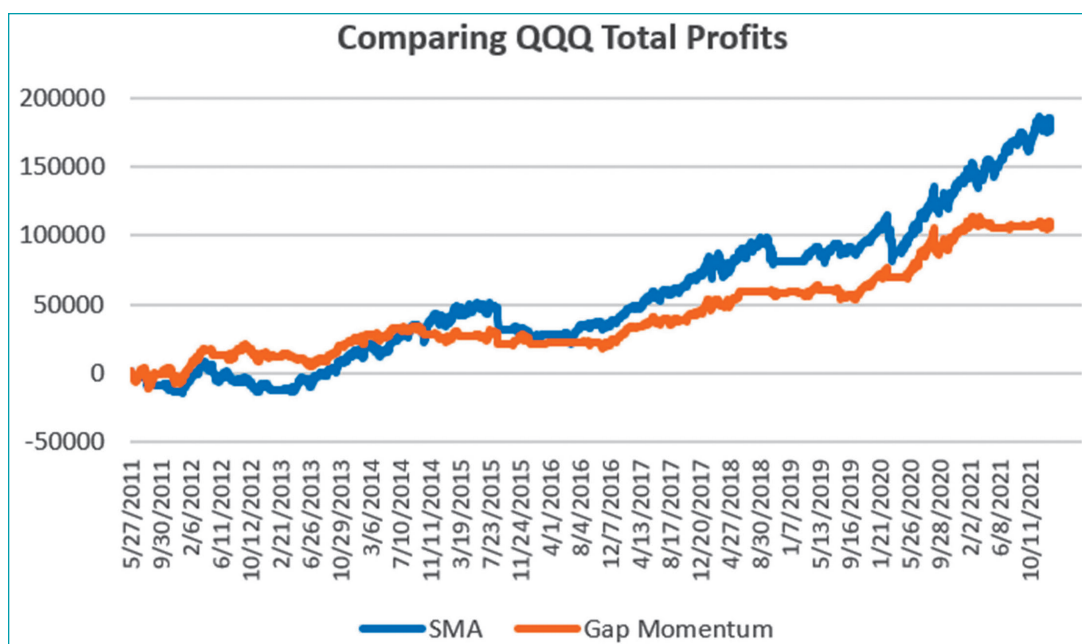Trading is very personal. No one can, or should, tell you how much risk to take. The comparative performance of the simple moving average and the gap momentum is typical of the decisions that need to be made. In this case, they are both profitable, which is a big bonus.

Perry J. Kaufman is a trader and financial engineer. He is the author of many books on trading and market analysis, including the sixth edition (2020) of Trading Systems and Methods *(with the first edition published in 1978 as a seminal book in the field of technical analysis), as well as* Kaufman Constructs Trading Systems *(2020), and* Learn To Trade *(2022). For questions or comments, please go to www.kaufmansignals.com.*
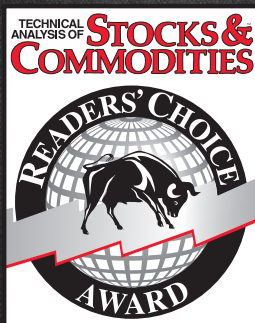
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